

## **REMARKS/ARGUMENTS**

### **I. Claim Status**

Claim 1 has been amended to incorporate all limitations of claims 4, 8, and 9. Additionally, Claim 1 has been amended to recite that the formulation is free of a compound consisting essentially of (i) an anti-EMAP II antibody; (ii) antisense EMAP II oligonucleotide; and (iii) EMAP II antagonist. Claims 4, 8, and 9 have been canceled.

Claim 27 has been amended to incorporate all limitations of Claim 31 and to recite that the formulation is free of a compound selected from the group consisting essentially of (i) an anti-EMAP II antibody; (ii) antisense EMAP II oligonucleotide; and (iii) EMAP II antagonist; wherein said formulation is isotonic and has a pH of about 3 to about 8. Claim 31 has been canceled.

Claim 38 has been amended to recite a kit comprising a formulation comprising about 0.1 mg/ml to about 15 mg/ml of a hypertension reducing agent and that the formulation is free of a compound selected from the group consisting essentially of (i) an anti-EMAP II antibody; (ii) antisense EMAP II oligonucleotide; and (iii) EMAP II antagonist; wherein said formulation is isotonic and has a pH of about 3 to about 8.

Claim 51 has been amended to recite a formulation comprising about 0.1 mg/ml to about 15 mg/ml of a hypertension reducing agent and that the formulation is free of a compound selected from the group consisting essentially of (i) an anti-EMAP II antibody; (ii) antisense EMAP II oligonucleotide; and (iii) EMAP II antagonist; wherein said formulation is isotonic and has a pH of about 3 to about 8.

The status of the remaining claims are as follows:

Claims 3-4, 8-9, and 31 have been canceled.

Claims 6-7, 10-11, 17-20, 22-24, 33, 35-37 and 41-50 have been withdrawn.

Claims 2, 5, 12-16, 21, 25-26, 28-30, 32, 39-40 and 52-69 are pending.

### **II. Rejections Under 35 USC §102(b)**

Claims 1-5, 12-14, 16, 21, 25-32, 38-40, 51-67 and 69 have been rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,554,610 to Williams et al. Claims 1-2,

12-16, 21, 25-30, 32, 34, 38-40, 51-52, 54, 57-61, 66-67 and 69 have been rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Publication No. US 20010031738 to Schwarz.

To establish anticipation, each and every element as set forth in the claim must be found either explicitly or inherently in a single prior art reference. Applicant submits that both Williams and Schwarz fail to teach each and every element recited in the claimed invention, and therefore claims 1, 27, 38, and 51, and any claims dependent thereon are not anticipated by the cited references.

#### **A. Williams Fails To Teach Each And Every Element Of Claims 1, 27, 38, And 51**

Williams does not anticipate the claimed invention because Williams fails to teach a formulation having any of the following:

- (i) an isotonic formulation;
- (ii) a pH of about 3 to about 8; and
- (iii) a concentration range between 0.1 to 15 mg/ml as recited in Claims 1, 27, 38, and 51.

As currently claimed, independent Claims 1, 27, 38, and 51 recite a formulation comprising a specific concentration range of a hypertension reducing agent, wherein the formulation is isotonic and has a pH of about 3 to about 8. Williams fails to teach the specific claimed concentration range of a hypertension reducing agent, an isotonic formulation, and a formulation with the currently claimed pH range. Since, Williams is completely silent regarding tonicity and pH, Williams fails to teach an isotonic formulation with the recited pH. Therefore, Williams fails to teach each and every element of independent Claims 1, 27, 38, and 51 or any claims dependent thereon.

Additionally, Williams teaches a dosage range of a vasodilator instead of concentration ranges. Examiner attempts to equate the dosage teachings of Williams to the concentration ranges currently claimed. Applicant respectfully submits that dosages (mass) and concentrations (mass/volume) are not equivalent characterizations. As such, the comparison of the purely dosage teachings of Williams with the concentration ranges of the claimed invention is improper. Williams provides a very broad mass range of an agent for the treatment of pulmonary hypertension and suggests that a given mass of an agent may be administered as a unit dose;

Williams does not disclose a volume per a unit dose. Therefore, Williams fails to teach a hypertension reducing agent concentration of an inhalable formulation, as recited in claims 1, 27, 38 and 51.

Even if the concentrations of the claimed invention could be comparable to the dosage teachings of Williams (which they cannot), the dosage ranges set forth in Williams are so broad that they cannot possibly disclose the narrower claimed concentration range with sufficient specificity to constitute anticipation under 35 USC §102. The Federal Circuit has repeatedly recognized that the "early disclosure of a genus does not necessarily prevent patentability of a species member of that genus." See e.g., *Eli Lilly & Co. Bd. Of Regents of the Univ. of Washington*, 334 F.3d 1264, 1270. Although Williams mentions a dosage range of 0.01mg to 50mg preferably 0.01mg to 10mg, Williams does not expressly identify the narrow claimed concentration of active ingredient of 0.1mg/ml to 15mg/ml, which is recited in independent Claims 1, 27, 38, and 51. The Examiner's reliance of William's unsupported, passing reference to an exceedingly broad range of dosage amounts as an anticipation of the currently claimed concentration range is the type of "mechanistic dissection and recombination" that results in a finding of anticipation by hindsight, which is improper. See *In re Ruschig*, 343 F.2d 965, 974 (C.C.P.A. 1965).

In addition, Williams does not anticipate independent Claims 1, 27, 38, or 51 because it does not explicitly or inherently discloses the specific concentration range recited in each of these claims. For example, currently amended Claims 1, 27, 38 and 51 recites "An inhalable formulation for the treatment of pulmonary hypertension, said formulation comprising about 0.1 mg/ml to about 15 mg/ml of a hypertension reducing agent ...". These specific concentration ranges are not specifically disclosed in Williams.

In contrast, the Williams reference discloses a dosage range of 0.01 mg to 50 mg, which encompasses the concentration ranges recited in the currently amended independent claims, and it also recites a dosage range of 0.01mg to 10mg which slightly overlaps with the claimed range. The relevant text of the Williams reference provides, in pertinent part:

An amount effective to treat the disorders hereinbefore described depends on the usual factors such as the nature and severity of the disorders being treated and the weight of the mammal. However, a unit dose will normally contain 0.01 to 50 mg for example 0.01 to 10 mg, of the Compound, or a pharmaceutically acceptable salt thereof. Unit doses will

normally be administered once or more than once a day, for example 2, 3, or 4 times a day, more usually 1 to 3 times a day such that the total daily dose is normally in the range of 0.0001 to 1 mg/kg...

See Williams at column 2, line 20 continuing through line 29.

Here, the Williams reference does not describe the specific ranges recited in the independent claims with sufficient specificity to anticipate them, given the significant difference between the claimed range and the range in the prior art. See *Atofina v. Great Lakes Chemical Corp.*, 441 F.3d 991 (Fed. Cir. 2006). Indeed, the disclosure of a 0.01mg to 10mg range in the Williams references does not constitute a specific disclosure of the claimed ranges of 0.1mg/ml to 15mg/ml. Once again, although there is a slight overlap, this overlap does not describe the entire claimed range with sufficient specificity to anticipate this limitation of each claim. See *id.* The ranges are different, not the same. Indeed, the lower end of the range in the Williams reference differs by an order of magnitude from what is recited in Claims 1, 27, 38 and 51 (*i.e.*, 0.1mg/ml vs. 0.01mg). In addition, the disclosure of a 0.01mg to 10mg range is not a disclosure of the end points of that range. See *id.* Thus, there is no anticipation because the Williams reference does not expressly disclose the concentration ranges recited in any of the independent claims. A copy of the *Atofina* case is attached for the Examiner's ready reference.

Further, there can be no anticipation on the grounds that the Williams reference discloses an embodiment using a specific dosage range that anticipates any of the independent claims. Specifically, the Williams reference discloses a preferred dosage range of 0.01mg to 10mg. This range is of sufficiently large breadth such that it does not constitute a disclosure of each endpoint or intermediate dosage in that range. See *id.* Thus, the Williams reference does not explicitly disclose a specific embodiment of the concentration ranges set forth in the independent claims of the present application.

Moreover, the Williams reference does not inherently disclose the concentration ranges recited in any of the independent claims of the present invention. As discussed above, Claims 1, 27, 38 and 51 require a formulation comprising a hypertension reducing agent with a concentration of about 0.1mg/ml to about 15mg/ml. As explained above, those concentration amounts are not expressly found in Williams. Nor are such amounts inherently disclosed. For

instance, the passage from Williams reproduced above does not inherently disclose the concentration range of any of the independent claims.

Because anticipation by inherent disclosure is appropriate only when the prior art reference necessarily includes the unstated limitation, Williams cannot inherently anticipate any of the independent claims of the present application. See *Transclean Corp. v. Bridgewood Servs., Inc.*, 290 F.3d 1364, 1373 (Fed. Cir. 2002). Therefore, the independent claims of the present application are not anticipated by the Williams reference.

In view of the current claim amendments and arguments presented above, it is respectfully submitted that the 35 U.S.C. §102(b) rejections under Williams have been overcome.

**B. Schwarz Fails To Teach Each And Every Element Of Independent Claims 1, 27, 38, Or 51**

Unlike Williams and the claimed invention, Schwarz is directed to formulations for inhibiting endothelial-monocyte activating polypeptide II (EMAP II). More specifically, Schwarz is directed to a method of administering a formulation utilizing an active compound that “inhibits EMAP II activity, including compounds that specifically bind to EMAP II (e.g., an antibody), compounds that downregulate EMAP II expression (e.g., an antisense oligonucleotide), or EMAP II receptor antagonists.” Schwarz generically discloses administering such an active compound either alone or in conjunction with another compound known to be useful in treating pulmonary hypertension such as a calcium-channel blocker, angiotensin-converting enzyme inhibitors, nitrous oxide, L-arginine, and digoxin. Therefore, the formulations according to Schwarz must include a compound that inhibits EMAP II activity (e.g., an antibody, an antisense oligonucleotide, or a receptor antagonist).

As currently claimed, the present invention expressly recites that the formulation is free of (i) an anti-EMAP II antibody; (ii) antisense EMAP II oligonucleotide; and (iii) EMAP II antagonist. Since the formulations of the Schwarz reference necessarily include specific compounds that inhibits EMAP II activity and the present invention explicitly excludes compound, the Schwarz formulations are completely different and unrelated to those formulations claimed in the present application.

Furthermore, the dosage ranges cited by the Examiner are based on the active compound, wherein the active compound is one that inhibits EMAP II activity (e.g., an antibody, an antisense oligonucleotide, or a receptor antagonist). See page 3, paragraph 27. Therefore, Schwarz fails to teach the concentration ranges for the hypertension reducing agents recited in the claims. Accordingly, Schwarz fails to teach every element of the currently amended independent claims.

### **III. Rejections under 35 USC §103(a)**

Dependent Claims 62-64 and 68 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,554,610 to Williams et al. Claims 62-64 are dependent from Claim 27, and Claim 68 is dependent from Claim 38. As currently claimed, independent Claims 27 and 38 recite an isotonic formulation that has a pH of about 3 to about 8. As a result, dependent claims 62-64 and 68 also recite an isotonic formulation having a pH of about 3 to about 8.

To establish a *prima facie* case of obviousness there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings. Additionally, the prior art references must teach or suggest all claim limitations. Furthermore, the teaching or suggestion to make the claimed invention must both be found in the prior art, not in applicant's disclosure. Accordingly, Examiner has failed to prove a *prima facie* case of obviousness because the reference cited does not teach or suggest each and every claimed limitation nor demonstrate any suggestion to modify or combine the prior art in the manner suggested by the Examiner. Nor has the Examiner provided a factual basis to support the general knowledge of one skilled in the art and how such knowledge renders the claim invention obvious in view of the cited references.

First, Williams fails to teach each and every element of Claims 62-64 and 68. Specifically, Williams fails to teach or suggest an isotonic formulation that has a pH of about 3 to about 8. As discussed earlier, Williams is completely silent regarding tonicity and pH. Additionally, Williams teaches a range of dosages and provides no guidance or motivation to alter the dosage teachings to achieve a formulation having a calcium-channel blocker concentration as recited. Furthermore, Williams fails to teach or suggest a formulation with the

recited amount of stabilizing agent. Finally, Williams fails to teach or suggest a pre-filled dispensing container with about 0.1 to 5.0 ml of the formulation designed to deliver a unit dose via nebulization.

The Examiner has failed to offer any support that the prior art, including the knowledge generally available to one of ordinary skill in the art, provides any suggestion or motivation to modify Williams to achieve the currently claimed invention. Specifically, the Examiner's obviousness rejection offers mere conclusory statements that one of ordinary skill in the art would seek to modify the teachings of Williams. Conclusory statements are insufficient to establish a prima facie case of obviousness.

The Examiner asserts that "optimization of concentration ranges are routine practice for those of ordinary skill in the art and not support for patentability." However, this is not a proper basis for maintaining an obviousness rejection. The Examiner must identify some teaching in the prior art that provides the necessary motivation to modify or combine references. As previously discussed, Williams does not provide any suggestion or motivation to modify its teachings to arrive at the claimed invention. Applicant respectfully submits that the Examiner has failed to identify any prior art that provides the necessary motivation to modify the teachings of Williams to achieve each and every limitation recited in the claims. Since Williams fails to disclose each and every claimed element and there is no motivation for modifying the reference, Claims 62-64 and 68 are patentable over the cited reference and applicant respectfully submits that the rejections under 35 U.S.C. §103 be withdrawn.

For these and the other reasons stated above, it is submitted that amended Claims 1-5, 12-16, 21, 25-32, 38-40, 51-69 are patentable over the cited references, and it is respectfully submitted that the rejections under 35 U.S.C. §102(b) and §103(a) have been overcome.

### **Conclusion**

In view of the amendments and remarks made above, Applicant submits that the pending Claims are now in condition for allowance. Applicant respectfully requests that the claims be allowed to issue. If the Examiner wishes to discuss the application or the comments herein, the Examiner is urged to contact the undersigned by telephone.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of

Appl. No.: 10/609,233  
Amdt.dated 08/02/2006  
Reply to Office action of 03/27/2006

this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,



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**H**Briefs and Other Related Documents

United States Court of Appeals, Federal Circuit.  
 ATOFINA, Plaintiff-Appellant,  
 v.  
 GREAT LAKES CHEMICAL CORPORATION,  
 Defendant-Appellee.  
 No. 05-1359.

March 23, 2006.  
 Rehearing and Rehearing En Banc Denied May 16,  
 2006.

**Background:** Owner of patent for method of synthesizing difluoromethane (CH<sub>2</sub> F<sub>2</sub>) sued competitor for infringement. The United States District Court for the District of Delaware, Sue L. Robinson, Chief Judge, 2005 WL 984361, found patent not infringed, invalid, and unenforceable. Owner appealed.

**Holdings:** The Court of Appeals, Lourie, Circuit Judge, held that:

10(1) patent was not infringed;

13(2) patent was not anticipated; and

17(3) owner did not engage in inequitable conduct before Patent and Trademark Office.

Affirmed in part and reversed in part.

Dyk, Circuit Judge, concurred in part, dissented in part, and filed opinion.

West Headnotes

**111 Patents 291 ↪ 324.5**

291 Patents  
291XII Infringement  
291XII(C) Suits in Equity  
291k324 Appeal  
291k324.5 k. Scope and Extent of

Review in General. Most Cited Cases

Patent claim construction is issue of law, reviewed de novo.

**121 Patents 291 ↪ 324.55(5)**

291 Patents  
291XII Infringement  
291XII(C) Suits in Equity  
291k324 Appeal  
291k324.55 Questions of Fact, Verdicts, and Findings  
291k324.55(5) k. Issues of Infringement. Most Cited Cases  
 Finding of patent infringement is question of fact, reviewed for clear error.

**131 Patents 291 ↪ 324.55(4)**

291 Patents  
291XII Infringement  
291XII(C) Suits in Equity  
291k324 Appeal  
291k324.55 Questions of Fact, Verdicts, and Findings  
291k324.55(3) Issues of Validity  
291k324.55(4) k. Novelty, Invention, Anticipation, and Obviousness. Most Cited Cases  
 Patent anticipation is question of fact, reviewed for clear error. 35 U.S.C.A. § 102.

**141 Patents 291 ↪ 324.54**

291 Patents  
291XII Infringement  
291XII(C) Suits in Equity  
291k324 Appeal  
291k324.54 k. Presumptions and Discretion of Lower Court. Most Cited Cases

**Patents 291 ↪ 324.55(2)**

291 Patents  
291XII Infringement  
291XII(C) Suits in Equity  
291k324 Appeal  
291k324.55 Questions of Fact, Verdicts, and Findings  
291k324.55(2) k. Clearly Erroneous Findings. Most Cited Cases

District court's ultimate determination of inequitable conduct, rendering patent unenforceable, is reviewed for abuse of discretion, while its threshold findings regarding materiality and intent to mislead are reviewed for clear error.

**[5] Patents 291 ↪165(1)**

**291 Patents**

291IX Construction and Operation of Letters Patent

291IX(B) Limitation of Claims

291k165 Operation and Effect of Claims in General

291k165(1) k. In General. Most Cited Cases

**Patents 291 ↪167(1)**

**291 Patents**

291IX Construction and Operation of Letters Patent

291IX(B) Limitation of Claims

291k167 Specifications, Drawings, and Models

291k167(1) k. In General. Most Cited Cases

**Patents 291 ↪168(2.1)**

**291 Patents**

291IX Construction and Operation of Letters Patent

291IX(B) Limitation of Claims

291k168 Proceedings in Patent Office in General

291k168(2) Rejection and Amendment of Claims

291k168(2.1) k. In General. Most Cited Cases

Court's primary focus in determining the ordinary and customary meaning of patent claim limitation is to consider intrinsic evidence of record, viz., patent itself, including claims, specification and, if in evidence, prosecution history, from perspective of one of ordinary skill in the art.

**[6] Patents 291 ↪159**

**291 Patents**

291IX Construction and Operation of Letters Patent

291IX(A) In General

291k159 k. Extrinsic Evidence in General.

Most Cited Cases

Although patent-construing court may rely on dictionary definitions of claim terms, court must ensure that any reliance on dictionaries accords with intrinsic evidence: claims themselves, specification, and prosecution history.

**[7] Patents 291 ↪101(2)**

**291 Patents**

291IV Applications and Proceedings Thereon

291k101 Claims

291k101(2) k. Construction in General.

Most Cited Cases

"Chromium catalyst," called for in patent for method of synthesizing difluoromethane (CH<sub>2</sub>F<sub>2</sub>), was catalyst in which only catalytically active material was chromium without addition of metal oxides or non-inert additives.

**[8] Patents 291 ↪167(1.1)**

**291 Patents**

291IX Construction and Operation of Letters Patent

291IX(B) Limitation of Claims

291k167 Specifications, Drawings, and Models

291k167(1.1) k. Specification as Limiting or Enlarging Claims. Most Cited Cases

**Patents 291 ↪168(2.1)**

**291 Patents**

291IX Construction and Operation of Letters Patent

291IX(B) Limitation of Claims

291k168 Proceedings in Patent Office in General

291k168(2) Rejection and Amendment of Claims

291k168(2.1) k. In General. Most Cited Cases

Meaning of patent claim language may be limited by disclaimer in specification or prosecution history.

**[9] Patents 291 ↪168(2.1)**

**291 Patents**


291IX Construction and Operation of Letters Patent

291IX(B) Limitation of Claims

291k168 Proceedings in Patent Office in General

291k168(2) Rejection and Amendment  
of Claims

291k168(2.1) k. In General. Most Cited Cases  
Patentee is held to amount of claim scope surrendered by amendment, even if amendment surrendered more than may have been absolutely necessary to avoid particular prior art.

[10] Patents 291  229

291 Patents

291XII Infringement

291XII(A) What Constitutes Infringement

291k228 Patents for Processes

291k229 k. Identity in General. Most

Cited Cases

Patent for method of synthesizing difluoromethane (CH<sub>2</sub>F<sub>2</sub>), calling for use of pure chromium catalyst, was not infringed by accused process whose chromium catalyst included non-inert additives.

[11] Patents 291  72(1)

291 Patents

291II Patentability


291II(D) Anticipation

291k72 Identity of Invention

291k72(1) k. In General. Most Cited

Cases

Patent anticipation requires showing that each limitation of claim is found in single reference, either expressly or inherently. 35 U.S.C.A. § 102.

[12] Patents 291  72(1)

291 Patents

291II Patentability


291II(D) Anticipation

291k72 Identity of Invention

291k72(1) k. In General. Most Cited

Cases

Although disclosure of genus in prior art is not necessarily anticipating disclosure of every species that is member of that genus, very small genus can be anticipating disclosure of each species within genus. 35 U.S.C.A. § 102.

[13] Patents 291  66(1.24)

291 Patents

291II Patentability

291II(D) Anticipation

291k63 Prior Patents

291k66 Operation and Effect

291k66(1.24) k. Process, Method, and Apparatus Claims in General. Most Cited Cases  
Prior art disclosure of method of synthesizing difluoromethane (CH<sub>2</sub>F<sub>2</sub>) within broad temperature range and ingredient ratios did not anticipate patent calling for synthesis within narrow subset of temperature range, partially overlapping ingredient ratio, and specific contact times; prior disclosure of large genus did not anticipate claimed species.

[14] Patents 291  97

291 Patents

291IV Applications and Proceedings Thereon

291k97 k. Patent Office and Proceedings

Therein in General. Most Cited Cases

Patent may be rendered unenforceable for inequitable conduct if applicant, with intent to mislead or deceive examiner, fails to disclose material information or submits materially false information to Patent and Trademark Office during prosecution.

[15] Patents 291  97

291 Patents

291IV Applications and Proceedings Thereon

291k97 k. Patent Office and Proceedings

Therein in General. Most Cited Cases

Party asserting patent's unenforceability due to inequitable conduct must prove threshold level of materiality and intent by clear and convincing evidence.

[16] Patents 291  97

291 Patents

291IV Applications and Proceedings Thereon

291k97 k. Patent Office and Proceedings

Therein in General. Most Cited Cases

Patent applicant's intent to deceive examiner cannot be inferred solely from fact that information was not disclosed; there must be factual basis for finding of deceptive intent.

[17] Patents 291  97

291 Patents

291IV Applications and Proceedings Thereon

291k97 k. Patent Office and Proceedings

Therein in General. Most Cited Cases

Failure of patent applicant to disclose full English translation of prior art Japanese patent was not inequitable conduct, such as would render patent for

method of chemical synthesis unenforceable, absent showing of intent to deceive; applicant disclosed translated abstract of patent, and did not mischaracterize it when discussing prior art with examiner.

Patents 291 → 328(2)

291 Patents

291XIII Decisions on the Validity, Construction, and Infringement of Particular Patents

291k328 Patents Enumerated

291k328(2) k. Original Utility. Most Cited

Cases

3,644,545. Cited as Prior Art.

Patents 291 → 328(2)

291 Patents

291XIII Decisions on the Validity, Construction, and Infringement of Particular Patents

291k328 Patents Enumerated

291k328(2) k. Original Utility. Most Cited

Cases

5,900,514. Valid and Not Infringed.

\*992 Thomas G. Rowan, Jones Day, of New York, New York, argued for plaintiff-appellant. With him on the brief were \*993 Daniel L. Malone, Eric C. Stops, and Gasper J. LaRosa.

Richard D. Harris, Greenberg Traurig LLP, of Chicago, Illinois, argued for defendant-appellee. With him on the brief was Brad R. Bertoglio.

Before LOURIE, RADER and DYK, Circuit Judges.

Opinion for the Court filed by Circuit Judge LOURIE.

Opinion concurring in part and dissenting in part filed by Circuit Judge DYK. LOURIE, Circuit Judge. Atofina appeals from the final decision of the United States District Court for the District of Delaware granting judgment in favor of Great Lakes Chemical Corporation ("Great Lakes") that Great Lakes did not literally infringe U.S. Patent 5,900,514 (the "'514 patent'"); claims 1, 2, 6, 7, 9, and 10 of the "'514 patent" were anticipated by Japanese publication 51-82206 ("JP 51-82206"); and the "'514 patent" was unenforceable because of inequitable conduct. *Atofina v. Great Lakes Chem. Corp.*, Civ. No. 02-1350 (D.Del. March 23, 2005) ("Final Judgment"). We affirm the district court's claim construction of the term "chromium catalyst" and hence its

determination of no literal infringement. However, because the district court clearly erred in finding that JP 51-82206 was an anticipatory reference meeting all the limitations of claims 1, 2, 6, 7, 9, and 10 of the '514 patent and also clearly erred in finding that the applicants of the patent intended to deceive the United States Patent and Trademark Office ("PTO"), we reverse its holdings of invalidity because of anticipation and unenforceability because of inequitable conduct.

## BACKGROUND

The '514 patent is entitled "Synthesis of Difluoromethane," and was issued to Elf Atochem, which subsequently became Atofina, as assignee. The invention is directed to a method of synthesizing difluoromethane (CH<sub>2</sub>F<sub>2</sub>) through the gas phase fluorination of methylene chloride (CH<sub>2</sub>Cl<sub>2</sub>), with hydrogen fluoride (HF), in the presence of an amount of oxygen (O<sub>2</sub>), within a particular temperature range, and with a chromium (Cr) catalyst. Claim 1 requires that the process be conducted in the presence of 0.1 to 5 moles of oxygen per 100 moles of methylene chloride, at a temperature of between 330 and 450 °C, with a "bulk or supported chromium catalyst." '514 patent, col. 7, ll. 20-25. The remaining asserted claims, 2, 5, 6, 7, 9, and 10, add further limitations: claim 2 further narrows the range of oxygen to methylene chloride ratios; claim 6 adds a requirement that the methylene chloride, oxygen, and hydrogen fluoride be in contact with the catalyst for a time between 0.01 and 10 seconds; claim 7 adds a pressure limitation requiring between 1 and 20 bars absolute; claim 9 is the same as claim 1 but with a different transition phase; and claim 10 is the same as claim 1 but with the addition of the contact time limitation from claim 6. Id., col. 7, ll. 26-27, col. 8, ll. 3-11, 14-28.

In 1993, Great Lakes began manufacturing difluoromethane using a mixed metal catalyst consisting of a chromium compound with another element that the district court referred to as Agent X,<sup>FN1</sup> carried out in the presence of 1.1 to 1.2 moles of oxygen per 100 moles of methylene chloride,\*994 at a temperature of 150 to 350 °C, and at a pressure between 5.5 and 7.6 bars absolute. *Atofina v. Great Lakes Chem. Corp.*, Civ. No. 02-1350, slip op. at 18 (D.Del. Feb. 23, 2005) ("Opinion"). The reactants in the process are in contact with the catalyst for approximately 10 seconds. Id. Agent X apparently enhances the selectivity of Great Lakes' fluorination reaction, as well as the catalyst life, but the process

would not work in the absence of chromium. *Id.*, slip op. at 18, 20.

FN1. Throughout this opinion, we will refer to a component of Great Lakes' proprietary catalyst formulation as Agent X.

On July 1, 2002, Atofina filed a complaint in the United States District Court for the District of Delaware accusing Great Lakes of infringing of the '514 patent. Great Lakes filed an answer and a counterclaim, alleging noninfringement, invalidity, and unenforceability because of inequitable conduct. After a bench trial, the court concluded that (1) Great Lakes did not infringe the '514 patent; (2) claims 1, 2, 6, 7, 9, and 10 were anticipated by JP 51-82206; (3) claim 5 of the '514 patent would not have been obvious in view of the prior art; (4) the '514 patent was not invalid for lack of enablement or failure to disclose the best mode; and (5) the '514 patent was unenforceable because of inequitable conduct. *Id.*, slip op. at 68. The court's holdings as to infringement, invalidity because of anticipation, and unenforceability because of inequitable conduct are at issue in this appeal.

First, the district court relied on the specification, the prosecution history, and dictionaries to construe the term "chromium catalyst" to mean "a substance that alters the velocity of a chemical reaction without itself being consumed, where the only catalytically active material is chromium without the addition of metal oxides, alkali metal fluorides, or non-inert additives." *Id.*, slip op. at 28-29. The court then determined that Great Lakes' catalyst did not meet the "bulk or supported chromium catalyst" limitation because it contained a non-chromium substance, Agent X, that was catalytically active or at the very least a non-inert additive that had been disclaimed in the specification. *Id.*, slip op. at 35-36. In addition, the court found that Great Lakes' catalyst contained a metal oxide other than chromium oxide that had been disclaimed by the applicants of the '514 patent during prosecution. *Id.*, slip op. at 36-37.

Second, the district court held that claims 1, 2, 6, 7, 9, and 10 were anticipated by JP 51-82206. *Id.*, slip op. at 39-45. Relying on *Titanium Metals Corporation v. Banner*, 778 F.2d 775, 782 (Fed.Cir.1985), the court determined that the broader temperature range of 100 to 500 °C recited in JP 51-82206 anticipated the narrower temperature range of 330 to 450 °C disclosed in the '514 patent. *Opinion*, slip op. at 41. The court also found that the additional limitation in

claim 2, that the oxygen to methylene chloride molar ratio be between 0.5 percent and 3 percent, was anticipated by JP 51-82206's disclosure of part of that range (0.001 to 1 percent oxygen to methylene chloride molar ratio), again relying on *Titanium Metals*. *Id.*, slip op. at 42. Furthermore, the court determined that although JP 51-82206 does not mention the contact times disclosed in claims 6 and 10, it nevertheless anticipates those claims because the "contact times may be calculated based on the information provided in the examples of JP 51-82206." *Id.*, slip op. at 43-44. The court also held that JP 51-82206 provides an enabling disclosure of the claimed process. *Id.*, slip op. at 45-47.

Finally, the district court held that the '514 patent was unenforceable because of inequitable conduct. *Id.*, slip op. at 58-67. The court first found that the fully translated version of JP 51-82206, which was not submitted to the PTO, was highly \*995 material "because it anticipate[d] all the limitations of claims 1, 2, 6, 7, 9, and 10 of the '514 patent." *Id.*, slip op. at 62, 66. The court then determined that Atofina intended to deceive the PTO based on its failure to disclose the full English translation of JP 51-82206, which it had in its possession. *Id.*, slip op. at 64. The court also based its finding of intent on Atofina's alleged misrepresentations to the PTO that JP 51-82206 disclosed a catalyst containing "chromium oxide and optionally other metal oxides" without mentioning that JP 51-82206 disclosed a catalyst of pure chromium oxide, as well as Atofina's alleged mischaracterizations of JP 51-82206 with respect to the scope of the reference and the contact times used in the reference. *Id.*, slip op. at 64-65. After balancing materiality and intent, the court concluded that the '514 patent was unenforceable because of inequitable conduct. *Id.*, slip op. at 67.

The district court entered judgment in favor of Great Lakes on March 23, 2005. Atofina timely appealed, and we have jurisdiction pursuant to 28 U.S.C. § 1295(a)(1).

## DISCUSSION

[1][2][3][4] Claim construction is an issue of law, *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 970-71 (Fed.Cir.1995) (en banc), that we review *de novo*, *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1456 (Fed.Cir.1998) (en banc). The district court's determination of infringement, in contrast, is a question of fact that we review for clear error. *Centricut, LLC v. Esab Group, Inc.*, 390 F.3d 1361,

1367 (Fed.Cir.2004). Anticipation is also a question of fact that we review for clear error. Hoover Group, Inc. v. Custom Metalcraft, Inc., 66 F.3d 299, 302 (Fed.Cir.1995). Finally, we review a district court's ultimate determination of inequitable conduct for abuse of discretion, and its threshold findings regarding materiality and intent to mislead for clear error. Brasseler, U.S.A. I, L.P. v. Stryker Sales Corp., 267 F.3d 1370, 1379 (Fed.Cir.2001). "A finding is 'clearly erroneous' when although there is evidence to support it, the reviewing court on the entire evidence is left with the definite and firm conviction that a mistake has been committed." United States v. U.S. Gypsum Co., 333 U.S. 364, 395, 68 S.Ct. 525, 92 L.Ed. 746 (1948).

### I. Infringement

On appeal, Atofina argues that the district court incorrectly construed the term "chromium catalyst." Atofina asserts that the correct construction of "chromium catalyst" is a substance which causes the reaction to take place in which chromium is the catalytically active metal. Atofina also contends that the court erred in excluding all "metal oxides" and "non-inert additives" from the meaning of "chromium catalyst" based on statements in the specification and in the prosecution history. According to Atofina, the court read those statements out of context and they did not amount to a "clear and unmistakable" surrender of subject matter. In addition, Atofina contends that the court misread the Buckman reference, U.S. Patent 3,644,545, in excluding alkali metal fluorides. Atofina then argues that under its construction of "chromium catalyst," Great Lakes' process infringed the '514 patent because the process would not have worked without chromium. Atofina further asserts that the patent covers catalysts made from chromium derivatives, and that the catalyst Great Lakes uses is a chromium derivative.

Great Lakes responds that the district court correctly construed "chromium catalyst" to exclude metal oxides, non-inert additives, and alkali metal fluorides. According to Great Lakes, Atofina disclaimed catalysts containing catalytically active substances other than chromium and catalysts containing non-inert additives. As support for its argument, Great Lakes points to statements in the specification that the catalyst in the '514 patent is "based on pure chromium (without the addition of another metal oxide)" and Atofina's assertions in the prosecution history that it was "unnecessary to employ special

additives" to increase the selectivity of its catalyst, and that the claims excluded "utilization of a combination catalyst, such as that taught by Tsuji," which disclosed a chromium-indium catalyst. Great Lakes then argues that it did not infringe the '514 patent because its catalyst contains Agent X, a catalytically active material other than chromium or alternatively a non-inert additive.

[5][6] We agree with Great Lakes that the court did not err in finding a lack of infringement. Our primary focus in determining the ordinary and customary meaning of a claim limitation is to consider the intrinsic evidence of record, *viz.*, the patent itself, including the claims, the specification and, if in evidence, the prosecution history, from the perspective of one of ordinary skill in the art. Phillips v. AWH Corp., 415 F.3d 1303, 1312-17 (Fed.Cir.2005) (en banc). At the same time, Phillips confirmed that courts may "rely on dictionary definitions when construing claim terms" and that "[d]ictionaries ... are often useful to assist in understanding the commonly understood meaning of words." *Id.* at 1322 (quoting Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1584 n. 6 (Fed.Cir.1996)). We have also stated, however, that "the court must ensure that any reliance on dictionaries accords with the intrinsic evidence: the claims themselves, the specification, and the prosecution history.... [I]n those circumstances where reference to dictionaries is appropriate, the [court's] task is to scrutinize the intrinsic evidence in order to determine the most appropriate definition." Free Motion Fitness, Inc. v. Cybex Int'l, Inc., 423 F.3d 1343, 1348-49 (Fed.Cir.2005) (citing Phillips, 415 F.3d at 1314, 1322-24).

As an initial matter, we conclude that the district court properly relied on scientific and technical dictionaries to construe the ordinary and customary meaning of the term "catalyst" as "a substance that alters the velocity of a chemical reaction without being consumed." Because there is no suggestion that the intrinsic evidence defines the term "catalyst," one may look to technical dictionaries for assistance in determining that term's meaning to a person of ordinary skill in the art. Phillips, 415 at 1318 ("Because dictionaries, and especially technical dictionaries, endeavor to collect the accepted meanings of terms used in various fields of science and technology, those resources have been properly recognized as among the many tools that can assist the court in determining the meaning of particular terminology to those of skill in the art of the invention. Such evidence, we have held, may be

considered if the court deems it helpful in determining 'the true meaning of language used in the patent claims.'"). The McGraw-Hill Dictionary of Scientific and Technical Terms 307 (4th ed.1989) defines a catalyst as a "[s]ubstance that alters the velocity of a chemical reaction and may be recovered essentially unaltered in form and amount at the end of the reaction." The district court correctly accepted that ordinary and customary meaning.

[7] Having agreed with the court's definition of the term "catalyst," we also agree with its construction of "chromium catalyst" as a catalyst where the only catalytically active material is chromium without<sup>997</sup> the addition of metal oxides or non-inert additives. The intrinsic record supports that interpretation. The specification states that "it has now been found that there is a temperature range in which a catalyst based on *pure chromium (without the addition of another metal oxide)* can produce, in the presence of oxygen," difluoromethane. <sup>514</sup> *patent*, col. 2, ll. 54-59 (emphasis added). The specification further explains that "it is necessary to have a catalyst containing solely chromium." *Id.*, col. 7, ll. 7-12. In addition, the specification makes clear that it is "unnecessary to employ special additives to increase [the fluorination reaction's] selectivity; the elimination of additives employed in the mixed catalysts enables the manufacture of the catalyst to be simplified and thereby its cost to be reduced." *Id.*, col. 3, ll. 10-14. We note that the use of the term "chromium" in the patent includes chromium oxide as it refers to "solely chromium (catalysts A and B)," and catalyst A is chromium oxide. *Id.*, col. 7, ll. 8-9.

[8] The prosecution history confirms a construction of "chromium catalyst" that excludes metal oxides and non-inert additives. As discussed in *Phillips*, the meaning of the claim language may be limited by a disclaimer in the specification or prosecution history. <sup>415</sup> *F.3d* at 1316-17. Here, the applicants' statements in distinguishing their claimed "bulk or chromium catalysts" over prior art are a disclaimer of claim scope as to metal oxides and non-inert additives. The '514 claims were initially rejected on August 6, 1997, as obvious over the prior art. The applicants responded on December 30, 1997, that "the claims recited the phrase 'consisting essentially of' which would exclude the utilization of a combination catalyst, such as that taught by [the Tsuji reference, EP 629440]. Nowhere in the applicants' disclosure is there mentioned a combination of chromium and indium catalyst. Rather the applicants' disclosure in comparative examples 2 and

3 indicates *the criticality of utilizing chromium catalyst alone rather than in combination with other metal components.*" (emphasis added).

The applicants also pointed out that contrary to what might be expected from the prior art, its chromium-based catalyst carried out the fluorination reaction without a decrease in the selectivity of the reaction and that it was "therefore unnecessary to employ special additives to increase its selectivity." The applicants repeated these assertions in their August 20, 1998, response to the PTO's second rejection. In addition, the applicants stated that "pure chromium means without the addition of a metal oxide" and that "[c]ontrary to what might be expected from the prior art, the present invention makes it possible to employ a catalyst based solely on chromium to carry out this fluorination reaction." We thus agree with the district court that the applicants' statements are a disclaimer of claim scope as to catalysts containing metal oxides and non-inert additives. *Phillips*, 415 at 1317 ("[T]he prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be.").

The district court also interpreted "chromium catalyst" as excluding catalysts containing alkali metal fluorides. The basis for the district court's construction as to "alkali metal fluorides" is the applicants' statements in the prosecution history that "[t]he recent claims exclude the utilization of an alkali metal fluoride noted in column 1, line 59 of Buckman, [U.S. Patent 3,644,545]." Buckman, which is entitled "Improved<sup>998</sup> Vapor Phase Fluorination Procedure in the Presence of Catalyst and Alkali Metal Fluoride," discloses a fluorination reaction "in the presence of a catalyst, when such reaction is carried out in the presence of an alkali metal fluoride." <sup>545</sup> *patent*, col. 1, ll. 54-59. While the Buckman specification apparently differentiates between the catalyst and the alkali metal fluoride in naming illustrative substances that may be employed as catalysts (Cr<sub>2</sub>O<sub>3</sub>, CrF<sub>3</sub>, and AlF<sub>3</sub>) versus alkali metal fluorides (KF and NaF) that should also be present in the reaction, but perhaps not as catalysts, and the applicants may thus have not intended to exclude an alkali metal fluoride as a catalyst, we are not prepared to find error in the district court's exclusion of alkali metal fluorides from its claim construction, as an alkali metal fluoride is clearly in the reference that the applicants were distinguishing. *Id.*, col. 2, ll. 47, 55.

[9] We reject Atofina's argument that the district court erred in its construction of "chromium catalyst" because the applicants' statements regarding "metal oxides" were intended to distinguish only nickel-chromium catalysts, not Agent X-chromium catalysts. That the applicants only needed to surrender nickel-chromium catalysts to avoid a prior art reference does not mean that its disclaimer was limited to that subject matter. "To the contrary, it frequently happens that patentees surrender more through amendment than may have been absolutely necessary to avoid particular prior art. In such cases, we have held the patentees to the scope of what they ultimately claim, and we have not allowed them to assert that claims should be interpreted as if they had surrendered only what they had to." *Norian Corp. v. Stryker Corp.*, 432 F.3d 1356, 1361-62 (Fed.Cir.2005) (citing *Fantasy Sports Props., Inc. v. Sportsline.com, Inc.*, 287 F.3d 1108, 1114-15 (Fed.Cir.2002)). Here, the patentee spoke expressly to the meaning of "chromium catalyst," both in the specification and in the prosecution history, noting that the catalyst was limited to "pure chromium (without the addition of another metal oxide)." We therefore agree with the district court that Atofina surrendered all catalysts containing non-chromium metal oxides.

[10] Having affirmed the district court's claim construction of the term "chromium catalyst," we also affirm its judgment of noninfringement. First, the court found that "[b]oth the Johnson Matthey report and the Syntex report demonstrated that defendant's catalysts contained several metal oxides including Agent X oxide." *Opinion*, slip op. at 36-37. While we have some question from reading the record whether Great Lakes' catalyst actually contains an Agent X oxide, we nonetheless will defer to the district court's finding of fact on that issue. It is not clearly erroneous. Second, we discern no clear error in the court's alternative determination that Agent X, if not a catalyst, was a non-inert additive. *Id.*, slip op. at 35 n. 13. Thus, because the district court made no clear error in its finding that Great Lakes did not infringe Atofina's properly construed claims, we affirm its judgment of non-infringement.

## II. Anticipation

On appeal, Atofina argues that JP 51-82206 does not anticipate any claim of the '514 patent because it does not disclose the manufacture of difluoromethane, recited in the preamble of claim 1; its disclosure of a

broader temperature range does not anticipate the specific temperature range claimed in the '514 patent; its disclosure of an oxygen to methylene molar ratio of 0.001 to 1.0 is not a disclosure of the claimed range of 0.1 to 5.0 percent; \*999 and it does not disclose the contact times required in claims 6 and 10. According to Atofina, the court's reliance on *Titanium Metals* was misplaced because that case stands for the proposition that a species can anticipate a genus, not the reverse.

Great Lakes responds that JP 51-82206 anticipates claims 1, 2, 6, 7, 9, and 10 of the '514 patent because the claimed ranges are within the disclosure of ranges in the prior art. According to Great Lakes, JP 51-82206's disclosure of a preferred temperature range of 150 to 350 °C encompasses the temperature range disclosed in the '514 patent of 330 to 450 °C. Great Lakes also contends that JP 51-82206's disclosure of the oxygen to methylene chloride molar ratios of 0.001 percent to 1.0 percent encompasses the ratios claimed in the '514 patent of 0.1 percent to 5.0 percent. In addition, Great Lakes argues that even though JP 51-82206 does not disclose the contact times as required by claims 6 and 10 of the '514 patent, the contact times are "typically and easily determined through calculation, by a person of ordinary skill in the art."

[11][12][13] We agree with Atofina that the district court clearly erred in finding that JP 51-82206 anticipates the '514 patent. Anticipation requires a showing that each limitation of a claim is found in a single reference, either expressly or inherently. *Perricone v. Medicis Pharm. Corp.*, 432 F.3d 1368, 1369 (Fed.Cir.2005). However, each limitation of the '514 claims is not in JP 51-82206. It is well established that the disclosure of a genus in the prior art is not necessarily a disclosure of every species that is a member of that genus. See, e.g., *In re Baird*, 16 F.3d 380, 382 (Fed.Cir.1994). There may be many species encompassed within a genus that are not disclosed by a mere disclosure of the genus. On the other hand, a very small genus can be a disclosure of each species within the genus. *In re Petering*, 49 C.C.P.A. 993, 301 F.2d 676, 682 (1962); see also *Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc.*, 246 F.3d 1368, 1380 (Fed.Cir.2001) ("[T]he disclosure of a small genus may anticipate the species of that genus even if the species are not themselves recited."). That is not the case here, however. A temperature range of over 100 degrees is not a small genus and the range of temperatures of JP 51-82206 does not disclose Atofina's temperature range.



To find anticipation here, the district court relied on our opinion in *Titanium Metals*. The court stated that “the ‘514 patent’s claim limitation of 330 to 450 °C is entirely within JP 51-82206’s temperature range of 100 and 500 °C. Consequently, this limitation of claim 1 is also disclosed by JP 51-82206.” *Opinion*, slip op. at 41. However, *Titanium Metals* stands for the proposition that an earlier species reference anticipates a later genus claim, not that an earlier genus anticipates a narrower species. 778 F.2d at 782. Here, the prior art, JP 51-82250, discloses a temperature range of 100 to 500 °C which is broader than and fully encompasses the specific temperature range claimed in the ‘514 patent of 330 to 450 °C. Given the considerable difference between the claimed range and the range in the prior art, no reasonable fact finder could conclude that the prior art describes the claimed range with sufficient specificity to anticipate this limitation of the claim. Because the court’s determination that JP 51-82250 disclosed the temperature range in claims 1, 2, 6, 7, 9, and 10 of the ‘514 patent was grounded in its erroneous application of *Titanium Metals*, we must reverse its finding of anticipation based on the temperature range.

Further, we reject Great Lakes’ argument that the district court’s finding of anticipation was correct because JP 51-82206 discloses a preferred embodiment using a specific temperature range (a species) that anticipates the ‘514 patent’s claim of a broader temperature range (a genus). JP 51-82206 discloses a preferred temperature range of 150 to 350 °C that slightly overlaps the temperature range claimed in the ‘514 patent. But that slightly overlapping range is not disclosed as such, *i.e.*, as a species of the claimed generic range of 330 to 450 °C. Moreover, the disclosure of a range of 150 to 350 °C does not constitute a specific disclosure of the endpoints of that range, *i.e.*, 150 °C and 350 °C, as Great Lakes asserts. The disclosure is only that of a range, not a specific temperature in that range, and the disclosure of a range is no more a disclosure of the end points of the range than it is of each of the intermediate points. Thus, JP 51-82206 does not disclose a specific embodiment of the claimed temperature range.

The district court also clearly erred in finding that the claimed oxygen to methylene chloride molar ratio of 0.1 to 5.0 percent was disclosed in JP 51-82206. JP 51-82206 discloses an oxygen to methylene chloride ratio of 0.001 to 1.0 percent that overlaps but does not fall within the range of ratios claimed in the ‘514 patent. Moreover, the disclosure of a 0.001 to 1.0

percent range in JP 51-82206 does not constitute a specific disclosure of 0.1 percent to 5.0 percent, as Great Lakes asserts. Once again, although there is a slight overlap, no reasonable fact finder could determine that this overlap describes the entire claimed range with sufficient specificity to anticipate this limitation of the claim. The ranges are different, not the same. Indeed, the lower end of the ratio in the reference differs by a factor of one hundred from what is claimed. In addition, the disclosure of a 0.001 to 1.0 percent range is not a disclosure of the end points of that range. Thus, there is no anticipation. Because JP 51-82206 does not expressly or inherently disclose the claimed range of ratios, JP 51-82206 does not anticipate claims 1, 2, 6, 7, 9, and 10 of the ‘514 patent.

Finally, the district court clearly erred in finding that JP 81-82206 inherently discloses the contact times found in claims 6 and 10 of the ‘514 patent. Claims 6 and 10 require that the “gas phase mixture of methylene chloride, anhydrous hydrogen fluoride and oxygen is in contact with the catalyst for a time between 0.01 and 10 seconds.” ‘514 patent, col. 8, ll. 6-11. Those contact times are not expressly found in JP 51-82206. Nor has Great Lakes shown that the contact times are inherently disclosed in JP 51-82206. The calculations Great Lakes points to as inherently disclosing the contact times are based on the first and second examples in JP 51-82206, which state the diameters and lengths of the reaction tubes and the flow rates, but do not say anything about any contact times. Because anticipation by inherent disclosure is appropriate only when the reference discloses prior art that must necessarily include the unstated limitation, JP 51-82206 cannot inherently anticipate the claims of the ‘514 patent. *Transclean Corp. v. Bridgewood Servs., Inc.*, 290 F.3d 1364, 1373 (Fed.Cir.2002). We therefore conclude that the district court clearly erred in determining that the contact times in claims 6 and 10 are disclosed in JP 51-82206.

Because the district court clearly erred in finding that JP 51-82206 discloses the temperature range, the range of oxygen to methylene chloride molar ratios, and the contact times claimed in the ‘514 patent, we reverse the district court’s finding of anticipation.

### III. Inequitable Conduct

On appeal, Atofina argues that the district court abused its discretion in its holding\*1001 of inequitable conduct because the full English

translation of JP 51-82206 that was not submitted to the PTO was not highly material and there was no basis for inferring an intent to deceive the PTO. According to Atofina, the court's sole basis for finding that the English translation of JP 51-82206 was highly material was that the reference anticipated several claims of the '514 patent (its materiality for obviousness purposes was not decided). Thus, Atofina contends that because the court's determination as to anticipation was clearly erroneous, the finding of materiality is also erroneous. As to intent, Atofina also contends that the court failed to consider evidence of good faith, such as Atofina's reference in the prosecution history to page numbers of the full translation of JP 51-82206. Atofina notes that the Derwent Abstract of JP 51-82206 was disclosed to the examiner and JP 51-82206 was cited in the patent specification.

Great Lakes responds that the district court's findings of a high level of materiality and intent were supported by clear and convincing evidence, and thus the court correctly held that the '514 patent was unenforceable. Great Lakes argues that the full English translation of JP 51-82206 was highly material because it was anticipatory and it teaches the use of a pure chromium catalyst. Great Lakes also points out that Atofina's application for a European counterpart to the '514 patent was rejected for lack of novelty over JP 51-82206, and issued only after Atofina amended its claims to include an additional limitation. According to Great Lakes, the prosecution of the European counterpart to the '514 patent is evidence of the materiality of the full English translation of JP 51-82206. In addition, Great Lakes argues that Atofina acted with intent to deceive the PTO in failing to disclose the full English translation of JP 51-82206, mischaracterizing prior art references, and also withholding information regarding poor results during the pilot phase testing of the '514 patent process. Great Lakes also contends that there was no evidence of good faith by Atofina in its failure to disclose the full English translation of JP 51-82206.

[14][15] We agree with Atofina that the district court abused its discretion in its conclusion that inequitable conduct occurred. "A patent may be rendered unenforceable for inequitable conduct if an applicant, with intent to mislead or deceive the examiner, fails to disclose material information or submits materially false information to the PTO during prosecution." *Digital Control, Inc. v. Charles Mach. Works*, 437 F.3d 1309, 1313 (Fed.Cir.2006). "The party asserting inequitable conduct must prove a threshold

level of materiality and intent by clear and convincing evidence." *Id.* Further, "materiality does not presume intent, which is a separate and essential component of inequitable conduct." *GFL, Inc. v. Franklin Corp.*, 265 F.3d 1268, 1274 (Fed.Cir.2001) (quoting *Marville Sales Corp. v. Paramount Sys., Inc.*, 917 F.2d 544, 552 (Fed.Cir.1990)).

[16] The issue here is whether Great Lakes proved intent by clear and convincing evidence. The district court inferred intent from the applicants' failure to disclose the full English translation of JP 51-82206 and its alleged mischaracterizations of that reference. However, the applicants' failure to disclose the full English translation of JP 51-82206 is not in and of itself enough to infer intent, even if the full English translation went beyond the Derwent Abstract, which is far from clear. See *Semiconductor Energy Lab. Co. v. Samsung Elecs. Co.*, 204 F.3d 1368, 1378 (Fed.Cir.2000) ("The duty at issue in this case is the duty of candor, not the duty of translation."). "Intent to deceive can not \*1002 be inferred solely from the fact that information was not disclosed; there must be a factual basis for a finding of deceptive intent." *Hebert v. Lisle Corp.*, 99 F.3d 1109, 1116 (Fed.Cir.1996).

[17] The district court's finding of intent additionally rests on three statements made by the applicants to the PTO: (1) the applicants' statement that JP 51-82206 discloses a catalyst containing "chiefly chromium oxide and optionally other metal oxides"; (2) the applicants' statement that a "person skilled in the art, who is looking for a means of fluorinating a specific H containing halocarbon (CH<sub>2</sub>Cl<sub>2</sub>) with good selectivity is therefore not prompted to consider the teachings of ... JP 51-82206"; and (3) the applicants' statement that "[t]hese specific process conditions effect a contact time of 10 seconds or less .... The short contact time is not taught in the applied references. Contact time indicated in the references are substantially in excess of this." *Opinion*, slip op. at 64-65 (emphasis in original). The court determined that the first statement misrepresented to the PTO that JP 51-82206 failed to disclose a catalyst of pure chromium oxide, the second statement mischaracterized JP 51-82206 by failing to identify that methylene chloride was a preferred starting material in that reference, and the third statement mischaracterized JP 51-82206 by failing to mention the inherent "contact times" allegedly disclosed in JP 51-82206.

We conclude that the district court clearly erred in finding that these three statements were sufficient to

prove intent. First, the applicants' statement that JP 51-82206 discloses a catalyst containing "chiefly chromium oxide and optionally other metal oxides" is consistent with the text of the full English translation of JP 51-82206, which asserts that its catalyst is "mainly comprising chromic oxide." And the Derwent Abstract that was disclosed to the PTO also states that the catalyst is "mainly comprising trivalent chromium oxide." "Mainly" and "chiefly" are words with similar meanings. Thus, there was no real difference between the disclosed Derwent Abstract and the undisclosed full English translation of JP 51-82206 in this context.

While the dissent states that "some parts of the majority opinion appear to hold there was no misdescription because JP 51-82206 does not disclose pure chromium oxide," that is incorrect. JP 51-82206 does disclose the use of a catalyst containing pure chromium oxide, JP 51-82206 at 4 ("Not only pure Cr<sub>2</sub>O<sub>3</sub> but also chromium oxides mainly comprising Cr<sub>2</sub>O<sub>3</sub> are usable in the present invention."), and we do not state otherwise. Moreover, characterizing a catalyst, as Atofina did, as containing "chiefly chromium oxide and optionally other metal oxides" is not inconsistent with it possibly being pure chromium oxide. Further, the dissent states that "chiefly chromium oxide" does not mean "chiefly Cr<sub>2</sub>O<sub>3</sub>" because "JP 51-82206 clearly used the term 'chromium oxides' to include oxides other than Cr<sub>2</sub>O<sub>3</sub>." While the language "chiefly chromium oxide" does encompass chromium oxides other than Cr<sub>2</sub>O<sub>3</sub>, it expressly discloses Cr<sub>2</sub>O<sub>3</sub>. Therefore, no reasonable fact finder could conclude that the applicants misrepresented to the PTO that JP 51-82206 failed to disclose a catalyst of pure chromium oxide. Because the applicants' statement was consistent with both the full English translation of JP 51-82206 and the Derwent Abstract, the district court clearly erred in finding that it supported an inference of intent.

Second, the applicants' statement that a "person skilled in the art, who is looking for a means of fluorinating a specific H containing halocarbon (CH<sub>2</sub>Cl<sub>2</sub>) with good \*1003 selectivity is therefore not prompted to consider the teachings of ... JP 51-82206" was not an omission of the fact that the preferred starting material in JP 51-82206 was methylene chloride. The seven starting materials disclosed in JP 51-82206, including *methylene chloride*, are disclosed in the first column of the '514 patent. '514 patent, col. 1, ll. 58-59. The applicants also stated to the examiner that JP 51-82206 "mentions, among the reactions, the fluorination of

CCl<sub>4</sub>, CHCl<sub>3</sub>, CH<sub>2</sub>Cl<sub>2</sub> [methylene chloride], CCl<sub>3</sub>F, C<sub>2</sub>Cl<sub>6</sub>, C<sub>2</sub>Cl<sub>4</sub>, and C<sub>2</sub>H<sub>3</sub> Cl<sub>3</sub>" and that the "preferred starting materials contemplated [in JP 51-82206] ... include perhalogenated molecules as well as H containing molecules," which include methylene chloride. Based on the record, we conclude that the district court clearly erred in finding that the applicants' statement was an attempt to hide the fact that methylene chloride was a preferred starting material in JP 51-82206.

Third, the applicants' statement that "[t]hese specific process conditions effect a contact time of 10 seconds or less ... The short contact time is not taught in the applied references. Contact time indicated in the references are substantially in excess of this" does not support an inference of an intent to deceive. As discussed previously, JP 51-82206 does not disclose any "contact times." Therefore, the district court clearly erred in finding that applicants' statement was misleading.

Thus, because the district court clearly erred in its findings of fact relating to an intent to deceive the PTO, we conclude that its holding of inequitable conduct based on those findings was an abuse of discretion. We therefore reverse that holding. Inasmuch as we reverse on intent, we do not discuss materiality.

We have considered the parties' remaining arguments and find them unpersuasive.

## CONCLUSION

We affirm the district court's conclusion of no literal infringement. The district court, however, clearly erred in finding that JP 51-82206 was an anticipatory reference meeting all the limitations of claims 1, 2, 6, 7, 9, and 10 of the '514 patent and also clearly erred in finding that Atofina intended to deceive the PTO so as to support a determination of inequitable conduct. We therefore affirm the court's judgment of no literal infringement, and we reverse its holdings of invalidity because of anticipation and unenforceability for inequitable conduct.

*AFFIRMED IN PART AND REVERSED IN PART.*  
DYK, Circuit Judge, concurring in part and dissenting in part.

I join the court's opinion insofar as it affirms the district court's finding of no literal infringement and reverses as to invalidity. I also agree that the district

court's inequitable conduct determination cannot stand. In my view, that determination rests on an erroneous finding of materiality based on a finding that JP 51-82206 anticipated claims 1, 2, 6, 7, 9, and 10 of the '514 patent. I would vacate and remand this issue so that the district court can reconsider the inequitable conduct claim free of this error. In my view the majority errs in deciding to reverse without remand.

The majority does not address the issue of materiality, but reverses the district court's inequitable conduct determination on the ground that the district court's intent finding was clearly erroneous. I do not disagree with the majority's<sup>1004</sup> determination that the district court's second and third grounds for finding intent were clearly erroneous. However, a key question on the issue of intent was whether the applicants misdescribed JP 51-82206 by stating that JP 51-82206 disclosed a catalyst "containing chiefly chromium oxide and optionally other metal oxides" as opposed to describing JP 51-82206 as disclosing a pure chromium oxide catalyst. (If it disclosed pure chromium oxide it would be highly material to the prosecution of this patent, even though not anticipatory.) Some parts of the majority opinion appear to hold that there was no misdescription because JP 51-82206 does not disclose pure chromium oxide and the applicants accurately stated that it contained "chiefly chromium oxide and optionally other metal oxides."

The district court stated that "JP 51-82206 specifies that the chromium catalyst can either be 'pure' chromium oxide or mainly chromium oxide." *Atofina v. Great Lakes Chem. Corp.*, Civ. No. 02-1250, slip op. at 4 (D.Del. Feb. 23, 2005); *see also id.* at 42. The finding that JP 51-82206 discloses pure chromium oxide is supported by the text of JP 51-82206 which states:

The Cr<sub>2</sub>O<sub>3</sub> catalyst usable in the present invention can be prepared by various processes .... [Describing calcinations processes]. Cr<sub>2</sub>O<sub>3</sub> prepared by calcining a chromium compound containing chromium hydroxide is particularly preferred. *Cr<sub>2</sub>O<sub>3</sub> prepared by these processes is not pure but it contains a small amount of other chromium oxides and has an atomic ratio of O/Cr of about 1.4 to 1.7. Not only pure Cr<sub>2</sub>O<sub>3</sub> but also chromium oxides mainly comprising Cr<sub>2</sub>O<sub>3</sub> are usable in the present invention.* A metal oxide other than chromium oxide such as an alkaline earth metal oxide can be added to the catalyst as another constituent.

J.A. 3037 (emphasis added). While JP 51-82206 may not disclose the use of pure Cr<sub>2</sub>O<sub>3</sub>, it certainly discloses the use of pure "chromium oxides" without the presence of other metals, as is required by the '514 patent. <sup>FN1</sup>

FN1. Atofina appears to argue that "chiefly chromium oxide"-which is how it described the catalyst disclosed in JP 51-82206-means "chiefly Cr<sub>2</sub>O<sub>3</sub>." This is misleading. Chromium oxide is "[a] compound of chromium and oxygen; chromium may be in the +2, +3, or +6 oxidation state." *McGraw-Hill Dictionary of Scientific and Technical Terms* 390 (6th ed.2003); *see also Van Nostrand's Scientific Encyclopedia* 787 (9th ed.2002) (describing "[t]he three oxides of chromium" as "CrO, Cr<sub>2</sub>O<sub>3</sub>, and CrO<sub>3</sub>"). Further, JP 51-82206 clearly used the term "chromium oxides" to include oxides other than Cr<sub>2</sub>O<sub>3</sub>.

What a prior art reference discloses or teaches is a question of fact. *Novo Nordisk Pharm., Inc. v. Bio-Tech. Gen. Corp.*, 424 F.3d 1347, 1355 (Fed.Cir.2005); *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 (Fed.Cir.2000). On this record, I see no basis for disturbing the district court's factual finding that JP 51-82206 disclosed "pure" chromium oxide.

The majority ultimately agrees that JP 51-82206 does disclose pure chromium oxide, but nonetheless concludes that the description in JP 51-82206 is not misleading. I cannot agree. The district court found as a factual matter that Atofina, which was in possession of a full-length English translation of JP 51-82206, misrepresented this aspect of the Japanese patent to the PTO. In the '514 patent, and in representations to the PTO, Atofina described JP 51-82206 as claiming a catalyst "containing chiefly chromium oxide and optionally other metal oxides." J.A. 1129 at 1:48-49 (emphasis added). The district court determined that Atofina's use of the term "chiefly" was misleading in that it implied that the Japanese patent only disclosed<sup>1005</sup> a chromium catalyst which included other components, rather than disclosing a catalyst containing chromium oxides. *Atofina*, Civ. No. 02-1250, slip op. at 64. The majority rejects the district court's interpretation, stating that "characterizing a catalyst, as Atofina did, as containing 'chiefly chromium oxide and optionally other metal oxides' is not inconsistent with it possibly being pure chromium oxide." Maj. Op. at 1002

(emphasis added). The majority thus appears to hold that the description is not misleading because it is not a direct misstatement. I fail to see how the majority can rule as a matter of law that the district court could not find that Atofina's reference is misleading because of the implication that it conveys. See *Semiconductor Energy Lab. v. Samsung Elecs. Co.*, 204 F.3d 1368, 1377 (Fed.Cir.2000) (affirming a finding of inequitable conduct where the patentee submitted a one-page, partial translation of a foreign reference because the partial translation focused "on less material portions" and "left the examiner with the impression that the examiner did not need to conduct any further translation or investigation"). In context, the withholding of information that JP 51-82206 did *in fact* disclose pure chromium oxide could itself support a finding of intent.

Under these circumstances, it is possible that the district court could properly find intent in connection with this withholding of JP 51-82206. I would afford the district court the opportunity to reconsider its inequitable conduct determination.

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